Amendments to the Claims

Please cancel claims 1-43 without prejudice upon entering new claims 44-78.

44. (New) An ionization source comprising:

an electrically conductive conduit configured to provide at least one sample for ionization, the conduit comprising a discharge end having an opening configured to discharge at least one sample from the conduit; and

an electrically conductive reference device positioned within the conduit.

45. (New) The source of claim 44 wherein a distance between the conduit and the reference device is greater than the Paschen distance.

46. (New) The source of claim 44 wherein the conduit is defined by an outer surface, and further comprising an electrically non-conductive shield disposed about at least a portion of the conduit outer surface.

47. (New) The source of claim 46 wherein the non-conductive shield is provided with an opening allowing an electrical conductor to pass through said shield to contact the conduit.

48. (New) The source of claim 44 wherein the reference device comprises a metal comprising one or more of stainless steel, platinum, and gold.

49. (New) The source of claim 44 further comprising an electrical circuit configured to establish and maintain an electrical potential between the conduit and the reference device.

50. (New) The source of claim 49 wherein said electrical circuit comprises a voltage selector configured to allow the electrical potential between the conduit and the reference device to be selectively determined.

51. (New) The source of claim 50 wherein the electrical circuit is configured to maintain an electrical potential between the conduit and the reference device of at least about 10 volts.

52. (New) The source of claim 50 wherein the electrical circuit is configured to maintain an electrical potential between the conduit and the reference device of less than about 250 volts.

53. (New) The source of claim 44 wherein the conduit is electrically grounded.

54. (New) An analytical instrument comprising:

an ionization source comprising:

a conduit configured to provide at least one sample for ionization, the conduit comprising an electrically conductive discharge end having an opening configured to discharge the sample from the conduit; and

an electrically conductive reference device positioned proximate the discharge end of the conduit, wherein upon discharge of the at least one sample from the conduit at least a portion of the at least one sample is ionized by electrical arcing between the discharge end and the reference device; and

an analyzer configured to receive the portion of the at least one sample.

55. (New) The instrument of claim 54 wherein a distance between the discharge end and the reference device is greater than the Paschen distance.

56. (New) The instrument of claim 54 further comprising a control circuit configured to generate pulses of electrical potential between the discharge end and the electrically conductive reference device sufficient to produce the electrical arcing periodically.

57. (New) The instrument of claim 54 further comprising a control circuit configured to generate an electrical potential between the discharge end and the electrically conductive reference device sufficient to produce the electrical arcing continuously.

58. (New) The instrument of claim 54 further comprising a sample transport system configured to transport the at least one sample to the discharge end of the conduit in a carrier fluid.

59. (New) The instrument of claim 54 wherein the reference device is positioned between the discharge end and the analyzer.

60. (New) The instrument of claim 54 wherein the reference device comprises a conductive probe disposed within the discharge end.

61. (New) The instrument of claim 54 further comprising a sweep gas system for removing at least one non-ionized sample from a region around the source prior to the introduction of the portion to the analyzer.

62. (New) The instrument of claim 54 further comprising an electrical circuit configured to establish and maintain an electrical potential between the discharge end and the reference device.

63. (New) The instrument of claim 62 wherein said electrical circuit comprises a voltage selector configured to allow the electrical potential between the discharge end and the reference device to be selectively determined.

64. (New) The instrument of claim 62 wherein the electrical circuit is configured to maintain an electrical potential between the discharge end and the reference device of at least about 10 volts.

65. (New) The instrument of claim 62 wherein the electrical circuit is configured to maintain an electrical potential between the discharge end and the reference device of at least about 250 volts.

66. (New) The instrument of claim 54 wherein the analyzer comprises an ion mobility spectrometry analyzer.

67. (New) The instrument of claim 54 wherein the analyzer comprises an atmospheric pressure ionization mass spectrometry analyzer.

68. (New) A sample ionization method comprising:

providing an electrically conductive sample conduit having a discharge end;

providing a reference device proximate the discharge end;

maintaining a first electrical potential at the conduit, and a second electrical potential at the reference device, such that an electrical potential exists there between;

transporting a sample through the conduit to a point proximate the discharge end and the reference device; and

causing electrical arcing between the conduit and the reference device at a time when the sample arrives at the point to ionize at least a portion of the sample to produce analyte ions.

69. (New) The method of claim 68 wherein the transporting comprises providing a carrier fluid for transporting the sample to the point.

70. (New) The method of claim 69 wherein the carrier fluid is a gas.

71. (New) The method of claim 68 wherein the electrical potential between the conduit and reference device is maintained slightly above a breakdown potential and the electrical arcing between the conduit and the reference device is caused by the presence of the sample altering the breakdown potential.

72. (New) The method of claim 68 wherein the electrical potential between the conduit and the reference device is maintained such as to produce a continuous arcing there between.

73. (New) The method of claim 68 wherein the electrical potential between the conduit and reference device is initially maintained at a level below a breakdown potential there between, the method further comprising periodically increasing the potential between the conduit and the reference device to cause periodic corona discharge therebetween.

74. (New) The method of claim 68 further comprising analyzing the analyte ions using an analyzer.

75. (New) The method of claim 68 further comprising adjusting at least one of the first or the second potentials to cause a corona discharge in the absence of the sample at the point, and altering the potential of at least one of the first or the second potentials to create an equilibrium state between the first and second potentials where no corona discharge occurs in the absence of the sample at the point.

76. (New) The method of claim 68 further comprising adjusting at least one of the first or the second potentials to cause a corona discharge in the absence of analyte ions at the point, and increasing the potential of at least one of the first or the second potentials to create a voltage potential difference between the conduit and the reference device of between about 10 and 50 volts.

77. (New) The method of claim 68 wherein the method is performed within an ion mobility spectrometer.

78. (New) The method of claim 68 wherein the method is performed within an atmospheric pressure ionization mass spectrometer.